HECO ST-8
DOCKET NO. 03-0417

SUPPLEMENTAL DIRECT TESTIMONY OF THOMAS L. HARRINGTON

PRESIDENT
TLH MANAGEMENT SERVICES, INC.

Subject: Construction Considerations

INTRODUCTION

Q. Please state your name and business address.

A. My name is Thomas L. Harrington. I am the President of TLH Management Services, Inc. My business address is 770 Kapiolani Boulevard, Suite 501, Honolulu, Hawaii.

Q. Have you previously submitted testimony in this proceeding?

A. Yes. I submitted written direct testimony and exhibits as HECO T-8.

Q. What is the scope of your supplemental testimony?

A. My supplemental testimony will discuss the following: 1) construction considerations for the proposed Change #1 to Phase 1 of the 46kV Phased Project (the use of six existing ducts in a common ductline between the existing Makaloa and McCully Substations) as discussed by Mr. Wong in HECO ST-2, and project improvements as a result of this proposed Change #1; 2) construction considerations for utilizing horizontal directional drilling during Phase 2; and 3) potential construction changes if the City’s recent directive regarding curb-to-curb repaving is enforced on the 46kV Phased Project.

PROPOSED CHANGE #1 – PHASE 1

Use of Existing Ducts

Q. Is use of existing ducts, for new circuit installations, a common practice?

A. Yes, if the ducts are available.

Q. What are the most important factors used to determine whether existing ducts can be utilized?

A. The most important factors are availability and condition of the ducts. Mr. Wong discusses the availability of ducts for Change #1 in HECO ST-2.

Q. What factors might negatively affect the condition of an existing duct influencing the ability to use the existing duct for a new circuit?

A. The most significant factor is ground settlement. Although none is anticipated, ground settlement, or more precisely, differential settlement can result in separated ducts and/or collapsed ducts. Both conditions can negatively affect the ability to remove existing cables from and install new cables in the damaged ducts. Another factor is blockage of ducts. This can occur if there is foreign material in the existing ducts such as mud, or rock, which may have entered the ducts via high water conditions with the build up taking place over many years. Such blockages, when discovered, are routinely cleared during duct cleaning procedures prior to the installation of new cable. However, for ducts with existing cables (as compared to available spare ducts), there have been situations where the existing cable or cables became stuck during removal because of foreign material in the duct.

Q. Approximately how much time could be added to the cable removal and duct preparation activities if these types of problems did occur?

A. A simple blockage or stuck cable could be cleared in a very short time, say hours rather than days. A separated or collapsed duct could add several days for each collapsed section of duct. However, visual surface inspections performed along the route of the existing ductline that follows the proposed Phase 1 alignment between the Makaloa and McCully Substations do not indicate the presence of any subsurface settlement.

<u>Phase 1 – Visual Surface Inspection of the Makaloa to McCully Route</u>

Q. Did you observe anything that would cause you to not recommend utilizing the existing ductline?

A. No. During my visual inspection, I did not see any signs of subsurface settlement along the existing ductline alignment.

Q. If separation, collapse or blockage of existing ducts were encountered during removal of the existing cables, are there any locations along the route where implementing the appropriate remedial response actions would not be feasible?

A. No. Along the existing ductline alignment, there appears to be sufficient work area space in the public right-of-way to implement appropriate response actions. The report attached to my testimony (HECO ST-801) identifies, for planning purposes, a list of potential situations that might impede the progress of removing the existing cables from the existing ductline, and corresponding responsive actions to be taken in the event such situations arise.

Phase 1 Project Improvements with Utilizing Existing Ducts

Q. Is the traffic disruption reduced by utilizing the existing ducts?

A. Yes. As noted in my testimony, HECO T-8 (page 7), trenching work for new ductline construction during the day on Makaloa Street and Kalakaua Avenue for Phase 1 would notably disrupt traffic. By utilizing the existing ducts on Makaloa Street (between Poni Street and Kalakaua Avenue) and Kalakaua Avenue, the need to trench in these areas is eliminated, thereby eliminating the associated traffic disruptions.

Q. If existing ducts are used in Phase 1 for the two new 46kV circuits to be installed between the Makaloa and McCully Substations, will the overall construction schedule for Phase 1 change?

A. No change has been made in the overall construction schedule of 10 to 12 months for Phase 1 as described in my testimony, HECO T-8 (page 6). While utilizing the existing ducts reduces construction time and schedule uncertainty for that portion of the construction work for Phase 1, there are other areas in Phase 1 that still require construction of new underground ductlines. The existing schedule reflects those new installations.

HORIZONTAL DIRECTIONAL DRILLING – PHASE 2

Q. Would you briefly describe horizontal directional drilling?

A. Horizontal directional drilling ("HDD") is a construction method that utilizes a drill rig to install underground pipes or casings. Drilling would follow a pre-planned underground profile, which would be designed to avoid conflicts with existing utilities and known sensitive areas below the ground surface. Therefore, drilling profiles would typically be designed to be deep enough to avoid any known potential conflicts. When HDD is used, trenching is typically limited to areas where the drill enters and exits the ground and areas of a project where drilling is not feasible. Heavy equipment is required at both the entry and exit pits located at each end of the drilling bore, and this equipment must generally remain in position while the installation progresses to completion.

There are several types of drilling machines available for HDD, ranging from small to large rigs with varying thrust and pullback force capabilities. Small rigs have thrust and pull back forces of less than 30,000 pounds, and a typical bore range limited to 300 feet or less, and can install underground pipes or casings of 2 to 6 inches. Medium sized rigs have thrust and pullback forces in the range from 30,000 to 100,000 pounds, and a typical bore range limited to 1,500 to 2,000 feet, and can install underground pipes or casings from 6 to 20 inches. Large size rigs have thrust and pullback capabilities ranging up to 1 million pounds, and bore ranges can exceed 5,000 feet, and can install underground pipes or casings from 6 to 60 inches. The selection of an appropriate drilling machine must be evaluated based on the particulars of a given HDD project.

Generally, large drilling rigs generate tremendous power, and are less susceptible to problems of unknown subsurface and geological conditions. However, they are often not suited for use in dense urban areas that have space restrictions and lack suitable staging areas, have restrictive work hours, and have lower levels of allowable noise (these machines are powered by large diesel engines), among other factors. Small and medium machines, which generate less thrust and pulling force, create a greater risk of not completing a given bore successfully when compared to the larger rigs. The small and medium rigs also require more entry and exit pits along the length of an extended drilling operation and may require multiple parallel bores due to the limited bore length and casing diameters. The lower production rates and multiple bores associated with small and medium size rigs also result in extending the time the drill rig must remain set-up in one area. However, small to medium size drill rigs have advantages over large rigs in that they require less workspace and are less noisy.

Q. Why is HECO considering the use of HDD on this project?

A. In March, 2004, the City Department of Facilities Maintenance requested that HECO consider the use of HDD along King Street in the Phase 2 portion of the proposed 46kV Phased Project. This request was made to HECO by the City agency during the course of a consultation meeting for the voluntary environmental assessment being prepared for the project.

Q. What has HECO done to evaluate the use of HDD in Phase 2?

A. HECO has retained an engineering consultant, Power Engineers, Inc., to evaluate the proposed Phase 2 installation of a ductline for three new 46kV underground circuits in King Street utilizing HDD technology. The evaluation, which is still underway, will examine the feasibility, cost, and construction effects of using HDD along King Street, from Cooke Street to McCully Street.

Q. Under what circumstances would HDD typically be contemplated for the installation of high-voltage underground cables?

A. HDD is typically contemplated when natural or man-made obstacles are perpendicularly present in a proposed underground alignment for the cable installation. Examples of natural obstacles would be rivers or sea channels. Examples of man-made obstacles would be freeways or canals. HDD could also be contemplated to mitigate traffic concerns in an urban setting if suitable work areas can be secured and left in place for the duration of the drilling operation.

Q. What factors must be evaluated to determine whether its preferable to use HDD for the King Street ductline proposed in Phase 2?

A. Preliminary analysis performed by Power Engineers, Inc. indicate that there are issues and constraints in using HDD technology associated with work area requirements and space availability, cable ampacity impacts, geological conditions, traffic disruption and costs, among others, that would have to be resolved to make HDD a preferable option for the Phase 2 construction work on King Street. More specifically, some of the major technical factors that must be evaluated for the use of HDD include:

1) Conducive soil conditions that would allow heat from the cables to dissipate sufficiently. The ampacity, or the magnitude of electric current, that an underground electrical cable can carry is affected by the ability to dissipate heat from the cable. The ampacity of a cable decreases the hotter a cable gets. Typically, directional drilling profiles are deeper than conventionally trenched

ductline installations to avoid conflicts with subsurface obstacles, such as existing utilities. A consequence of having the cables installed deeper into the ground is that heat dissipation is reduced, thereby decreasing the cable ampacity. With the greater depth of installation for HDD ductlines, soil conditions become a more significant factor and play a critical role in the heat dissipation process.

2) Conducive geological conditions that would allow the drilling to be controlled. If the project area has "mushy" soil conditions or there are underground caverns present, it is difficult to control the direction of the drill head. This is critical when known subsurface obstacles to be avoided are in the project area.

3) Availability of work areas for drilling equipment and pipe assembly. The work area required for drilling equipment typically ranges from 12 feet by 100 feet for a small to medium size HDD drill rig, up to 100 feet by 150 feet for a large drill rig, depending on the set-up configuration of the HDD drilling equipment. Pipe assembly space depends on the drill lengths required. For example, if the drill length is 1000 feet, approximately that amount of linear workspace is needed to lay down that length of pipe in preparation to be pulled into the ground.

Q. At this point in the evaluation, what appear to be the most significant constraints in utilizing this technology for installing the three new 46kV underground circuits on King Street in Phase 2 of the project?

A. Preliminary analysis performed by Power Engineers, Inc. indicates that cable ampacity impacts, work space limitations, traffic disturbances, and uncertainty in securing needed permits and approvals are significant constraints in utilizing HDD on King Street. Due to the soil conditions on King Street, there will be cable ampacity constraints on the installed cables with the use of HDD as opposed to conventional trenching.

Aside from the roadway itself, there are very limited work areas to set up the drilling equipment. If the large drilling rigs were used, Thomas Square, McKinley High School, Pawaa Community Park, and Washington Middle School appear to be the only areas that have space to set up the drilling equipment. However, use of these areas would be contingent upon obtaining the necessary approvals and permits. For the small to medium size drill rigs, the drilling equipment could also be set up on King Street itself. However, this would require obtaining the necessary permits from the City to allow the equipment to remain on the roadway around the clock until the drilling operation is complete for a given segment. The typical 12 by 100 foot area for a small to medium size drill rig situated on King Street is anticipated to require the closure to traffic of two adjacent 10-foot lanes to accommodate the work area.

The final pipe assembly would have to be done on the roadway itself, and would have to be in line with the exit pit. This would require a traffic lane to be blocked for the length of the pipe, which could range from several hundred feet to over 1,000 feet for a day or more. With these pipe lengths, the lay down area would include certain cross streets (such as Pensacola Street and/or Piikoi Street). To avoid completely blocking the heavily traveled streets crossing King Street, a shallow trench would have to be dug across those intersections that would be blocked by the HDD pipe assembly and pulling operation. The pipe could then be laid out, assembled and placed within the trench and the trench could be covered with steel plates to allow vehicular travel. After the drilling operations are complete, the temporary trench would be backfilled and the roadway surface restored. However, the need to trench major roadway intersections (and the need to block lanes to set up the drill rigs), with the related traffic disruptions, would negate some of the hoped-for benefits leading to consideration of the use of HDD technology.

Q. When will HECO complete its evaluation of the use of HDD technology for the proposed Phase 2 installation of three new 46kV underground circuits in King Street?

A. A report by Power Engineers, Inc. of their evaluation of HDD for Phase 2 work will be included in the voluntary environmental assessment being prepared for the project.

<u>CITY'S DIRECTIVE ON CURB-TO-CURB REPAVING</u>

Q. Briefly describe the City's directive on curb-to-curb repaving?

A. As described by Mr. Wong in HECO ST-2, the City's directive requires utility companies to repave a City street curb-to-curb after it has been trenched. Currently, City ordinance only requires the trenched area of the street to be repaved.

Q. What are the potential construction changes if this directive were applied to the 46kV Phased Project?

A. The greatest change would be the construction cost. Ms. Oshiro's testimony, HECO ST-9, describes the cost increase related to curb-to-curb repaving. Because more roadway would need to be repaved, the duration for paving activities would be lengthened accordingly. However, this would not impact the overall construction schedule because paving would be done simultaneously as other construction activities occur in other parts of the project. Generally, there would only be minor differences in the disruption to traffic arising from curb-to-curb repaving because the higher-volume traffic flow streets such as Makaloa Street and King Street is planned to be repaved at night when traffic volumes are low. The repaving of full street widths would require restrictions on the use of parking along one curb of Makaloa and King Streets, as well as relocations of some bus stops, that otherwise would not be affected by partial repaving. The amount of time on-street parking would be prohibited on those streets would be lengthened to accommodate repaving curb-to-curb. Full width paving would also have some effect to the operation of the City Bus Rapid Transit, if it were operating along King Street at the time of the Phase 2 construction.

Q. Does this conclude your testimony?

A. Yes, it does.